Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1. (Original) A method for determining an identity of a speaker by voice, comprising:

extracting a set of topological indices from an embedding of spectral functions of a speaker's voice; and

using a selection of the topological indices as a biometric characterization of the speaker to identify and verify the speaker from other speakers.

2. (Currently Amended) The method as in claim 1, further comprising:

analyzing a voice sample from a second speaker to extract a set of topological indices for the second speaker;

comparing the set of topological indices for the second speaker to the set of topological indices for the speaker;

verifying the second speaker as the speaker when there is a match between the set of topological indices for the second speaker [[to]]and the set of topological indices for the speaker; and

identifying the second speaker as a person different from the speaker when there is not a match.

3. (Currently Amended) The method as in claim 1, further comprising:

extracting sets of topological indices from voices of different known speakers;

analyzing a voice sample from an unknown speaker to extract a set of topological indices for the unknown speaker;

comparing the set of topological indices for the unknown speaker to the sets of topological indices for the known speakers to determine whether there is a match; and

when there is a match, identifying the unknown speaker as a known speaker whose set of topological indices matches the set of topological indices for the unknown speaker.

4. (Currently Amended) The method as in claim 1, further comprising:

storing the set of topological indices for the speaker in a portable device;

obtaining a voice sample from a user in possession of the portable device;

analyzing the obtained voice sample ~~form~~from the user to extract a set of topological indices for the user;

providing a reader device to read the set of topological indices for the speaker from the portable device;

comparing the set of topological indices for the speaker read from the portable device and the set of topological indices for the user to determine if there is a match; and

identifying the user as the speaker when there is a match.

5. (Original) The method as in claim 4, further comprising using a magnetic storage device as the portable device.

6. (Original) The method as in claim 5, wherein the portable device is a magnetic card and the set of topological indices for the speaker is stored in the magnetic card.

7. (Original) The method as in claim 6, wherein the magnetic card comprises a magnetic strip that stores the set of topological indices for the speaker.

8. (Original) The method as in claim 4, wherein the portable device has a surface that is printed with a bar code pattern and the set of topological indices for the speaker is stored in the bar code pattern.

9. (Original) The method as in claim 4, further comprising using an electronic storage device as the portable device.

10. (Original) The method as in claim 4, further comprising using an optical storage device as the portable device.

11. (Original) The method as in claim 1, wherein the extraction of the set of topological indices from voices of the speaker comprises:

processing the speech signal from the speaker to obtain spectral functions;

constructing closed three-dimensional orbits from the spectral functions;

obtaining a set of topological indices from the orbit with respect to a reference; and

selecting a subset of the topological indices as the biometrical signature for the speaker.

12. (Original) A method, comprising:

recording and processing a speech signal from a speaker;

computing linear prediction coefficients from the speech signal;

computing power spectrum from the linear prediction coefficients;

constructing a three-dimensional periodic orbit based on the power spectrum;

constructing a three-dimensional periodic orbit from a power spectrum of a natural reference signal;

obtaining topological information about the periodic orbits of the speech signal and the natural reference signal; and

using a selective set of topological indices to distinguish a speaker who produces the speech signal from other speakers who have different topological indices.

13. (Original) The method as in claim 12, wherein the topological information is obtained from relative rotation rates between the periodic orbit of the speech signal and another reference orbit and/or rotation rates of the periodic orbit with itself.

14. (Original) The method as in claim 12, wherein the topological information is obtained from an orbit by computing linking properties and/or self linking properties.

15. (Original) The method as in claim 12, wherein the topological information is obtained from the orbit by computing a knot type in an embedding.

16. (Original) The method as in claim 12, wherein each three-dimensional periodic orbit is constructed with respect to a Cartesian coordinate system with axes defined by the power spectrum with different phase delays.

17. (Original) The method as in claim 12, wherein each three-dimensional periodic orbit is constructed with respect to a Cartesian coordinate system with axes defined by other integrodifferential embeddings.

18. (Original) The method as in claim 12, further comprising:

forming a database to include different selective sets of topological indices for a plurality of known speakers; and

comparing a selective set of topological indices of an unknown speaker to the database to determine if there is a match.

19. (Original) A method, comprising:

providing a database having voice prints of known speakers, wherein each voice print includes a set of topological numbers to distinguish a speaker from other speakers and is derived from a relation between a periodic orbit derived from a power spectrum of the speaker's voice and periodic orbit from a power spectrum of an audio reference in a three-dimensional space; and

comparing a voice print of an unknown speaker to the database to determine if there is a match.

20. (Original) The method as in claim 19, wherein the three-dimensional space is defined by power spectrum functions with different delay values.

21. (Currently Amended) The method as in claim [[20]]19, wherein the three-dimensional space is defined as a three-dimensional integrodifferential embedding.

22. (Currently Amended) An apparatus for providing a[[A]] voice print for identifying a speaker from other speakers, comprising:

a storage medium that stores a set of rational numbers characterising topological features of spectral functions to distinguish a speaker from other speakers,

wherein the topological parameters are derived from a relation between a periodic orbit from a power spectrum of the speaker and a periodic orbit for a power spectrum of an audio reference in a three-dimensional space.

23. (Original) A speaker recognition system, comprising:

a microphone to receive a voice sample from a speaker;

a reader head to read voice identification data of rational numbers that represent a known speaker from a portable storage device; and

a processing unit connected to the microphone and the reader head, the processing unit operable to extract topological information from the voice sample from the speaker to produce topological rational numbers from the voice sample and to compare the rational numbers of the known speaker to the topological rational numbers from the voice sample to determine whether the speaker is the known speaker.

24. (Currently Amended) The system as in claim [[22]]23, wherein the reader is a magnetic reader which reads data from a magnetic portable storage device.

25. (Currently Amended) The system as in claim [[22]]23, wherein the reader is an optical reader which reads data from an optical portable storage device.

26. (Currently Amended) The system as in claim [[22]]23, wherein the reader is an electronic reader which reads data from an electronic portable storage device.

27. (New) The system as in claim 23, wherein the topological rational numbers are based on a relation between a periodic orbit from a power spectrum of the speaker and a periodic orbit for a power spectrum of an audio reference in a three-dimensional space.